

VIRGINIA AGRICULTURAL COUNCIL PREPROPOSAL FORM

Title: Development of a novel turf grass grazing system: protecting natural resources, ensuring horse health and evaluating economic impact

Objectives

A well-managed grazing system provides the most economical setting to care for horses while protecting the environment and horse health. The aim is to develop novel grazing systems for horses that protect soil and water as valuable natural resources, provide a safe low-yielding nutritional source for horses prone to metabolic disease, and reduce economic losses. The study described herein will serve as a springboard to identify potential turf grass species based on their growth and yield characteristics, nutritional content, palatability, and water retention properties that are candidates for small acreage farms and pastures for horses prone to metabolic disease. Specific aims of the project are to:

- Identify turf grass species that are: dense and sod forming to anchor soil and reduce nonpoint source (NPS) pollution; hardy and tolerant under dry summer and harsh winter conditions typical to Virginia; low-yielding so that forage consumption may be reduced in metabolic disease-prone horses; mid-level in palatability to prevent lack of grazing or overgrazing, and relatively low in nonstructural carbohydrates to reduce the risk of metabolic disease in the horse.
- Increase awareness of the use of turf grass pastures for grazing horses through educational Extension workshops, in-service training, publications and social media.
- Reduce on-farm economic losses of nutrients and water, as well as off-site costs to restore impaired water quality resulting from nonpoint source pollution.
- Reduce feed, labor and veterinary costs by providing appropriate grazing systems for horses prone to metabolic disease.

Approach

Experimental Design, Materials and Methods. Research will be conducted at the Virginia Polytechnic Institute and State University's Middleburg Agricultural Research and Extension Center in Middleburg, VA (VT MARE Center). A randomized complete block design with 4 replications will be used to evaluate 8 different cool-season grass monocultures and 8 different warm-season grass monocultures in individual 3 x 6 m plots under grazing by 4 adult horses. Two day grazing trials and sample collection will be conducted monthly from June 2015 to June 2016. All plots will be evaluated for maturity, yield, height, ground cover, nutrient content, grazing preference, grazing tolerance, tolerance to horse traffic, soil quality, soil bulk density, and botanical composition, and forage nutrient content. Maturity will be determined using a scale developed by Moore et al. (1991). Yield and height will be estimated using a rising plate meter and by hand harvesting forage from duplicate 0.25 m² quadrats. Ground cover and botanical composition will be determined using a modified line-intercept method. Forage samples will be oven dried at 70° C for 48 h to determine DM yield and ground to 1mm. Ground samples will be submitted to a commercial laboratory (Dairy One, Ithaca, NY) to determine nutrient content. Horse preference and grazing tolerance will be determined by visually assessing the removal percentage of the available forage height and mass after grazing by horses. Soil samples will be

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submitted to the Virginia Tech Soil Testing Laboratory to assess fertility and biodiversity (Blacksburg, VA). Tolerance to horse traffic and soil compaction will be evaluated using a radiometer and penetrometer, respectively. Rainfall simulations (2 x 2 m) will be installed to collect runoff water samples for each grass monoculture to evaluate hydrological properties. The simulations will imitate 200-year storm events, producing rainfall at approximately 70 - 83 mm/hr. Runoff will be collected for 30 minutes using grab samples and submitted to the BSE Water Quality Laboratory (Blacksburg, VA) to measure total phosphorous (TP), total nitrogen, and total suspended solids. Environmental conditions, including temperature, humidity, and rainfall, will be monitored using a weather station for the duration of the study.

Outreach and Economic Impact. Education and outreach efforts will be made through Virginia Cooperative Extension to encourage the adoption of novel turf grass grazing systems that are economical, yet foster horse and environmental health. Two Extension workshops targeting stakeholders and an Extension Agent In-Service Training will be held at the VT MARE Center to demonstrate turf grasses and their use for horse pastures. An Extension publication will be created and social media will be used to increase outreach and dissemination of study findings to encourage proper grazing management and adoption of novel grazing systems using turf grasses. Surveys and Extension program evaluations will be used to track economic impact on Virginia agriculture and the state's horse industry.

Justification: Impact on Virginia Agriculture

The Virginia horse industry has a \$1.2 billion impact on the state's economy. The overall number of farms is decreasing in Virginia, yet the number of farms with horses is growing (Rephann, 2011). However, the size of these horse farms is decreasing resulting in a greater number of small acreage farms. Small acreage farms often have poor grazing management that can lead to nutrient, sediment, and pathogen pollution of nearby watersheds, thus reducing water quality. The pollution mainly occurs as a result of overstocking, overgrazing, and improper manure management. By the same token, the practice of grazing livestock is important because it can reduce feed and labor costs, promote normal behavior, and provide a good source of nutrition and exercise. One key management practice that helps to balance grazing animal production and environmental stewardship is to maintain a thick productive stand of pasture grasses that serves to anchor soil and slow nutrient run-off. However, one of the biggest challenges in managing grazing horses is their propensity to overeat and become overweight. In Virginia, 51% of horses studied were classified as overweight or obese and at risk for the metabolic diseases such as laminitis (Thatcher et al., 2008). To prevent obesity and laminitis, many horse owners maintain their horses in poorly vegetated pastures or paddocks with no vegetation (e.g. dry-lots). Consequently, those areas are associated with a high rate of soil erosion (Fiorellino et al., 2014) and an increased risk of nutrient and pathogen run-off, which all contributes to NPS pollution and degradation of water quality.

Forage grasses typically recommended for use in horse pastures in Virginia are high-yielding and highly palatable because they were developed to be a nutritious livestock feed. However, they are often intolerant of close grazing and heavy animal

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traffic. In contrast, turf grasses were developed to create a dense and durable ground cover that withstands close mowing and is tolerant to trampling, which are ideal characteristics for small acreage farms with elevated stocking rates. Turf grass yields are lower than traditional forage grasses, but this trait can be advantageous in grazing systems for horses that are prone to obesity and metabolic disease. Current information on the use of turf grasses under grazing conditions does not exist. Our findings will benefit Virginia agriculture by improving our understanding of the potential for turf grasses to be used in grazing systems for small acreage horse farms, as well as in the management of horses prone to metabolic disease.

Economic Impact on Virginia Agriculture

Erosion and NPS pollution caused by overgrazed pastures and poorly managed dry lots can lead to significant economic on-farm losses of nutrients and water, in addition to off-site costs to repair subsequent impaired water quality. The development and use of novel turf grass grazing systems will reduce erosion and subsequent financial losses on small acreage farms and pastures used for horses prone to metabolic disease.

Specific economic impact and cost benefits resulting from this study will include:

- Thousands of acres with bare or low cover will be converted to productive turf grass pastures which will reduce economic losses from soil erosion
- Thousands of acres maintaining a dense sod will reduce NPS pollution entering the local watersheds, thus reducing on-farm and off-site financial burden of restoring impaired water quality
- Thousands of horses will have improved health due to reductions in the incidence of metabolic disease, which will reduce veterinary costs

References

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- Moore, K.J., L.E. Moser, K.R. Vogel, S.S. Waller, B.E. Johnson and J.F. Pedersen. 1991. Describing and quantifying growth stages of perennial forage grasses. *Agron. J.* 83:1073-1077.
- Rephann, T. 2011. Economic Impact of the Horse Industry in Virginia. Virginia Horse Industry Board, Richmond, VA.
- Thatcher, C., R.S. Pleasant, R. Geor, F. Elvinger, K. Negrin, J. Franklin, L. Gay, and S. Werre. 2008. Prevalence of obesity in mature horses: An equine body condition study. *J. Anim. Phys. Anim. Nutr.* 92(2):222.

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INVESTIGATOR(S): Bridgett McIntosh (PI), Amy Burk, John Fike, Tess Marshall, Rebecca Splan, Mike Goatley, and Richard Taylor

DURATION (years) one _____ **two** X

BUDGET (yr. one) \$6,921 (total): \$16,951

COMMODITY GROUPS	CHECK <i>ONE</i> GROUP THAT BEST DESCRIBES YOUR PROJECT
Aquaculture	
Fruit/Wine	
Livestock Dairy Poultry Hogs Beef Sheep Goats Horses	X (Horses)
Nursery/ Forestry	
Row Crops	
Turf/Seed	
Vegetable	
Educational	
Miscellaneous Agriculture	